1. **D** 
   \[3 - 9x \leq 21; x \geq -2\]

2. **A** 
   \[x^3 + 27 = 0; (x + 3)(x^2 - 3x + 9) = 0;\]
   \[x = -3 \text{ or } x = \frac{3 \pm 3i\sqrt{3}}{2}\]

3. **C** 
   \[\log_2 x + \log_2(x + 2) = 3; \log_2(x^2 + 2x) = 3;\]
   \[x^2 + 2x - 8 = 0; x = 4, 2 \text{ and}\]
   \[\log_3(y)(3y + 8) = 1; 3y^2 + 8y - 3 = 0;\]
   \[y = \frac{1}{3}, \frac{1}{3}, \text{ sum of } x \text{ and } y = 2\frac{1}{3}\]

4. **B** 
   \[(\log_2 4)(\log_3 5)...(\log_{99} 100) = \]
   \[\log 99 \cdot \log 100 \cdot \log 4 \cdot \log 5 \cdot \log 6 \cdot \log 7 \cdot \log 8 \cdot \log 9\]
   \[\log 2 \cdot \log 3 \cdot \log 4 \cdot \log 5 \cdot \log 6 \cdot \log 7 \cdot \log 8 \cdot \log 9 = \]
   \[\frac{2 \log 99}{\log 2 \cdot \log 3} = \frac{2 \log 99}{4} \cdot \log 2 \cdot \log 3\]

5. **A** 
   \[x^3 + 14x^3 - 51 = 0; \text{letting } y = x^3 \text{ gives}\]
   \[y^2 + 14y - 51 = 0; (y + 17)(y - 3) = 0;\]
   \[y = -17, 3; x^3 = -17 \text{ no solution;}\]
   \[x^3 = 3; x = 3^{\frac{1}{3}}, x = 3\sqrt{3}\]

6. C 
   \[x^2 + 3x - 9 \geq 3x^2 - 14; 0 \geq 2x^2 - 3x - 5;\]
   \[0 \geq (2x - 5)(x + 1) \text{ makes the critical points}\]
   \[\frac{5}{2}, -1\]. Plotting these on a number line and testing the zones gives the solution\[\left[-1, \frac{5}{2}\right]\]

7. **C** 
   \[0 = 2x^2 - 7x + 4; p^2 + q^2 = \text{sum of squares of roots}\]
   \[\frac{b^2 - 2ac}{a^2} = \frac{49 - 2 \cdot 2 \cdot 4}{4} = \frac{33}{4};\]
   \[pq = \text{product of the roots} = \frac{c}{a} = 2.\]
   \[\frac{33}{4} + \frac{8}{4} = \frac{41}{4}\]

8. **D** 
   \[x + y = 10, x^2 + y^2 = 148.\] Solving the first equation for \(x\) gives \(x = 10 - y\). Substitute this in the 2nd equation to get \((10 - y)^2 + y^2 = 148;\)
   \[100 - 20y + y^2 + y^2 = 148;\]
   \[2y^2 - 20y - 48 = 0;\]
   \[2(y - 12)(y + 2) = 0; y = 12, -2.\]
   \[|y - 12| = 14\]

9. **B** 
   \[|17x - 4| > 3; 17x - 4 > 3, x > \frac{7}{17};\]
   \[17x - 4 < -3, x < \frac{7}{17}.\] Plotting the critical points on the number line and testing the zones gives \((-\infty, \frac{7}{17}) \cup (\frac{7}{17}, \infty)\).

10. **B** 
    \[\sqrt{3 + 2\sqrt{3}} = \sqrt{3}; \text{squaring both sides}\]
    gives \(3 + 2\sqrt{3} = 3x\); moving the 3 to the right hand side gives \(2\sqrt{3} = 3x - 3.\) Square both sides \(12x = 9x^2 - 18x + 9;\)
    \[0 = 9x^2 - 30x + 9; x = \frac{1}{3}, \frac{1}{3}; \frac{1}{3} \text{ does not work,}\]
    the solution is 3 which is only 1 solution.

11. **A** 
    \(y = \sqrt{110 - \sqrt{110 - \sqrt{110}}}; \text{substituting}\)
    gives \(y = \sqrt{110 - y}; \text{square both sides}\)
    \(y^2 = 110 - y; y^2 + y - 110 = 0; y = \sqrt{11}; 10.\)

12. **C** 
    \(3^{2x+1} = 27^x; 3^{2x+1} = (3^3)^x;\)
    \(3^{2x+1} = 3^{3x}; 2x + 1 = 3x^2; x = -\frac{1}{3}, 1\)
    For the 2nd equation: \(2^{-2}(2^{4x}) = 2^4(2^{-6y});\)
    \(2^{4y-2} = 2^{-6y+4}; 4y - 2 = -6y + 4, y = \frac{3}{5},\)
    the sum of \(-\frac{1}{3} + \frac{3}{5} = \frac{19}{15}\)
13. B  \(3x^2 + 4x + 1 < 5; 3x^2 + 4x - 4 < 0\); factoring gives the critical points as \(\frac{2}{3}, -2\). The integers between these two points are \(-1\) and 0.

14. D  \((-2x + y)^7\) we want the \(x^3y^4\) term.
\[
\frac{7!}{4!3!} \cdot (-2x)^3 (y)^4 = 35(-8x^3)y^4
\]
\[= -280x^3y^4\]

15. C  \(f(x) = -2x + 1, g(x) = 3x - 1, h(x) = 3\).
Graph these lines and find the points of intersection. The points we want \((0, 2), (1, 2)\).

16. B  \(\text{together} \quad \frac{x}{60} + \frac{x}{40} = 1;\)
\(2x + 3x = 120, x = 24\) minutes

17. E  \(f\left(\frac{1}{2x}\right) = \frac{2x^2 - 1}{3x}.\) To find the inverse of \(\frac{1}{2x}\),
which is \(\frac{1}{2x}\) substituted that into get \(f(x)\).
\[
f(x) = \frac{2\left(\frac{1}{2x}\right)^2 - 1}{3\left(\frac{1}{2x}\right)} = \frac{1 - 2x^2}{3x},
\]
\[
f(2x) = \frac{1 - 2(2x)^2}{3 \cdot 2x} = \frac{1 - 8x^2}{6x}.
\]

18. A  \(\frac{1}{x - 2} \geq \frac{2}{x + 3}; x + 3 \geq 2x - 4; x \leq 7\), test the discontinuities \(x = 2, -3\) to get
\((-\infty, -3) \cup (2, 7]\)

19. C  \(-7 < -2x + 4 \leq 3; \frac{1}{3} > x \geq \frac{1}{2}\)

20. D  Product of the roots is
\[
k \cdot (-1)^n = \frac{10(-1)^5}{2} = -5
\]

21. C  \(a^3 + b^3 = 18, (a + b)(a^2 - ab + b^2) = 18;\)
\((a + b)^2 = 3^2; a^2 + 2ab + b^2 = 9\)
substituting \(a + b = 3\) gives
\[3(a^2 - ab + b^2) = 18.\]
\[a^2 - ab + b^2 = 6.\]
\[-(a^2 + 2ab + b^2) = 9.\]
adding these two equations gives
\[-3ab = -3, ab = 1.\]
Since \(a^2 - ab + b^2 = 6\) and knowing \(ab = 1\) we add \(-ab = -1\) to the equation and get
\[a^2 - 2ab + b^2 = 5\] making \((a - b)^2 = 5, |a - b| = \sqrt{5}\).

22. B  Find \(f(x)\), plug in inverse of \(2x + 1\) which is \(\frac{x - 1}{2} = \frac{9x + 5}{2x + 4}, f(-2x) = \frac{-18x + 5}{-4x + 4}\)

23. A  \(x + 4 \leq 0, x \leq -4.\) Check domain restrictions \(x^2 + x - 6 = (x + 3)(x - 2)\) which gives
\((-\infty, -3) \cup (-3, 2]\).

24. D  Subbing \(-1\) in for \(x\) we get
\[1 - b - 3 = 0, b = -2.\] Now we can find the quadratic is \(x^2 - 2x - 3 = 0\) which factors as \((x - 3)(x + 1) = 0, x = -1, 3.\)
25. A For the 2nd equation, the value of the determinant of the left hand side has a value of $3x + 2$, the right hand side has a value of $y - 8$. Set these equal to each other and get $3x - y = -10$. Now solve the system

\[
\begin{align*}
2x + y &= -10 \\
3x - y &= -10
\end{align*}
\]

which gives a solution of $x = -4, y = -2$. The sum of these is $-6$.

26. D The center of the circle is $(2,3)$ and the radius is 5. For the parabola, the vertex is $(2,-2)$ and the $y$-intercept is $(0,10)$. Graph these two and find the number of points of intersection is 3.

27. A Opposite reciprocal slope. $7x + 4y = B$, plug in for $B$ gives $7(-1) + 4(-3) = B, B = -19$, $7x + 4y = -19$. The $x$-intercept would be $C \over A = -19 \over 7$.

28. C Use Ps and Qs to find possible roots are $\pm (1,2,5,10)$, $\pm (1,3)$, 6 is not a possible root.

29. E The sum of the roots is $\frac{-b}{a} = -7$, product is $\frac{c}{a} = 11$ so the factors of the new quadratic are $(x + 7)(x - 11)$ making the quadratic $x^2 - 4x - 77 = 0$.

30. D $100x = 32.3232...$

$x = .323232...$

subtracting these gives $99x = 32, x = \frac{32}{99}$